

## Social Issues: Education

### Parent–Child Interaction: Impact on Language and Cognitive Development of Deaf Children

About one in every 1,000 North American infants is born profoundly or fully deaf (Deafness Research Foundation, 2005). When a deaf child cannot participate fully in communication with caregivers, development is severely compromised. Yet the consequences of deafness for children's language and cognition vary with social context, as revealed by comparing two groups of deaf children: those with hearing parents and those with deaf parents.

Over 90 percent of deaf children have hearing parents who are not fluent in sign language. In toddlerhood and early childhood, these children often are delayed in development of language and make-believe play. In middle childhood, many achieve poorly in school and are deficient in social skills. Deaf children of hearing parents frequently display impulse-control problems, as well (Arnold, 1999). Yet deaf children of deaf parents escape these difficulties! Their language (use of sign), play maturity, and impulse control are on a par with hearing children's. After school entry, deaf children of deaf parents learn easily and get along well with adults and peers (Bornstein et al., 1999b; Spencer & Lederberg, 1997).

These differences can be traced to early parent–child communication. Children with limited and less sensitive parental communication lag behind their agemates in achieving verbal control over their behavior—in thinking before they act and in planning. Beginning in infancy, hearing parents of deaf children are less positive, less responsive to the child's efforts to communicate, less effective at achieving joint attention and turn-taking, less involved in play, and more directive and intrusive (Spencer, 2000; Spencer & Meadow-Orlans, 1996). In contrast, the quality of interaction between deaf children and deaf parents resembles that of hearing children and hearing parents.

Hearing parents are not to blame for their deaf child's problems. Rather, they lack experience with visual communication, which enables deaf parents to respond readily to a deaf child's needs. Deaf parents know they must wait for the child to turn toward them before interacting (Loots & Devise, 2003). Hearing parents tend to speak or gesture while the child's attention is directed elsewhere—a strategy that works with a hearing but not with a deaf partner. When the child is confused or unresponsive, hearing parents often feel overwhelmed and become overly controlling (Jamieson, 1995).

The impact of deafness on language and cognitive development can best be understood by considering how it affects parents and other significant people in the child's life. Deaf children

need access to language models—deaf adults and peers—to experience natural language learning. And their hearing parents benefit from social support along with training in how to interact sensitively with a nonhearing partner.

Screening techniques can identify deaf babies at birth. Many U.S. states, some Canadian provinces, and an increasing number of Western nations now require that every newborn be tested, enabling immediate enrollment in programs aimed at fostering effective parent–child interaction (Hearing Foundation of Canada, 2006). When children with profound hearing loss start to receive intervention within the first year of life, they show much better language, cognitive, and social development (Yoshinaga-Itano, 2003).



When this mother signs "eat" to her 16-month-old child, who is deaf, he responds with babblelike hand motions, similar to the babbling that hearing infants do through speech. Babbling, whether spoken or signed, supports production of meaningful language.

ahead of their agemates in language skills (Karrass & Braungart-Rieker, 2005; Whitehurst & Lonigan, 1998).

Do social experiences that promote language development remind you of those that strengthen cognitive development in general? CDS and parent–child conversation create a *zone of proximal development* in which children's language expands. In contrast, impatience with and rejection of children's efforts to talk lead them to stop trying and result in immature language skills (Baumwell, Tamis-LeMonda, & Bornstein, 1997). In the next chapter we will see that sensitivity to children's needs and capacities supports their emotional and social development as well.

## Ask Yourself

**Review** Why is the social interactionist perspective attractive to many investigators of language development? Cite evidence that supports it.

**Apply** Prepare a list of research-based recommendations on how to support language development during the first two years.

**Connect** Cognition and language are interrelated. List examples of how cognition fosters language development. Next, list examples of how language fosters cognitive development.

**Reflect** Find an opportunity to speak to an infant or toddler. How did your manner of speaking differ from the way you typically speak to an adult? What features of your speech are likely to promote early language development, and why?

## Summary

### Piaget's Cognitive-Developmental Theory

According to Piaget, how do schemes change over the course of development?

- In Piaget's theory, by acting directly on the environment, children move through four stages in which psychological structures, or **schemes**, achieve a better fit with external reality.
- Schemes change in two ways: through **adaptation**, which is made up of two complementary activities—**assimilation** and **accommodation**; and through **organization**, the internal rearrangement of schemes into a strongly interconnected cognitive system.

Describe the major cognitive achievements of the sensorimotor stage.

- Piaget's **sensorimotor stage** is divided into six substages. Through the **circular reaction**, the newborn baby's reflexes gradually transform into the more flexible action patterns of the older infant. During Substage 4, infants develop **intentional**, or **goal-directed**, behavior and begin to understand **object permanence**. Substage 5 brings a more flexible, exploratory approach, and babies no longer make the **A-not-B search error**. In Substage 6, sensorimotor development culminates with **mental representation**, as shown by sudden solutions to sensorimotor problems, mastery of object permanence problems involving invisible displacement, **deferred imitation**, and **make-believe play**.

What does follow-up research say about the accuracy of Piaget's sensorimotor stage?

- Many studies suggest that infants display a variety of understandings earlier than Piaget believed. Some awareness of object permanence,

as revealed by the **violation-of-expectation method**, may be evident in the first few months, although searching for hidden objects is a true cognitive advance, as Piaget suggested. Recent studies of deferred imitation and problem solving also suggest that infants are capable of mental representation in the first year.

- Today, researchers believe that newborns have more built-in equipment for making sense of their world than Piaget assumed. According to the **core knowledge perspective**, infants are born with a set of core domains of thought that support early, rapid cognitive development. Overall, however, findings on the existence of "prewired," ready-made knowledge are mixed, and critics reject the assumption that infants are endowed with knowledge.

- Nevertheless, broad agreement exists on two issues. First, many cognitive changes of infancy are gradual and continuous rather than stagelike. Second, various aspects of cognition change unevenly, rather than in an integrated fashion.

### Information Processing

Describe the information-processing view of cognitive development and the general structure of the information-processing system.

- Rather than providing a single, unified theory, information-processing researchers study many aspects of thinking. They want to know exactly what individuals of different ages do when faced with a task or problem.
- Most information-processing researchers assume that we hold information in three parts of the mental system, where **mental strategies** operate on and transform it so that it can be retained and

used efficiently. Information enters the **sensory register**, is actively processed in **working**, or **short-term**, memory, and is permanently stored in **long-term** memory. The **central executive**—the conscious, reflective part of our mental system—is a special part of working memory that directs the flow of information.

#### What changes in attention, memory, and categorization take place over the first two years?

- With age, infants attend to more aspects of the environment, take information in more quickly, and flexibly shift their attention from one stimulus to another. In the second year, attention to novelty declines and sustained attention improves, especially during play with toys.
- Retention of visual events increases dramatically over infancy and toddlerhood. By 6 months, babies have a memory span of two weeks for operant responses; by 18 months, this has increased to 13 weeks. Habituation/recovery studies show that infants learn and retain much information solely through observation, especially by attending to the movements of objects and people.
- Young infants are capable of **recognition** memory, the simplest form of memory. By the end of the first year, they can also engage in **recall**, remembering without perceptual support. Between 1 and 2 years, recall of people, places, objects, and actions is excellent. Both brain development and social experience probably contribute to the decline of **infantile amnesia** and the emergence of **autobiographical** memory.
- Infants group stimuli into increasingly complex categories, shifting from a perceptual to a conceptual basis of categorization in the second half of the first year. In the second year, toddlers become active categorizers, spontaneously sorting objects during their play. Babies' exploration of objects, expanding knowledge of the world, and advancing language skills foster categorization.

#### Describe the contributions and limitations of the information-processing approach to our understanding of early cognitive development.

- Information-processing findings challenge Piaget's view of infants as purely sensorimotor beings who cannot mentally represent experiences. However, information processing has not yet provided a broad, comprehensive theory of children's thinking.

#### The Social Context of Early Cognitive Development

##### How does Vygotsky's concept of the zone of proximal development expand our understanding of early cognitive development?

- According to Vygotsky's sociocultural theory, complex mental activities originate in social interaction. Through the support and guidance of more skilled partners, infants master tasks within the **zone of proximal development**—that is, tasks just ahead of their current capacities. As early as the first year, cultural variations in social experiences affect mental strategies.



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#### Individual Differences in Early Mental Development

##### Describe the mental testing approach, the meaning of intelligence test scores, and the extent to which infant tests predict later performance.

- The mental testing approach measures intellectual development in an effort to predict future performance. The **intelligence quotient**, or **IQ**, is a mental test score that compares an individual's performance with that of a **standardization** sample, whose performances form a **normal**, or bell-shaped, **distribution**. IQ is higher or lower, depending on how much the test-taker's performance deviates from the mean of the standardization sample.
- Infant tests, which consist largely of perceptual and motor responses, predict later intelligence poorly. As a result, scores on infant tests are called **developmental quotients**, or **DQs**, rather than IQs. Speed of habituation and recovery to visual stimuli and object permanence are better predictors of future performance.

##### Discuss environmental influences on early mental development, including home, child care, and early intervention for at-risk infants and toddlers.

- Research with the **Home Observation for Measurement of the Environment (HOME)** shows that an organized, stimulating home environment and parental affection, involvement, and encouragement of new skills repeatedly predict higher mental test scores. Although the HOME-IQ relationship is partly due to heredity, family living conditions also affect mental development.
- The quality of infant and toddler child care influences cognitive and social skills. Standards for **developmentally appropriate practice** specify program characteristics that meet the developmental needs of young children.
- Intensive early intervention can prevent the gradual declines in intelligence and the poor academic performance of poverty-stricken children. Findings of the Carolina Abecedarian Project reveal long-lasting advantages in IQ and achievement, which translated into higher educational attainment and skilled employment rates for treatment than control participants.
- Early Head Start in the United States has led to warmer, more stimulating parenting, a reduction in harsh discipline, cognitive and language gains, and lessening of child aggression. Such programs, however, are not yet plentiful enough to meet the need.



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#### Language Development

##### Describe three theories of language development, and indicate the emphasis each places on innate abilities and environmental influences.

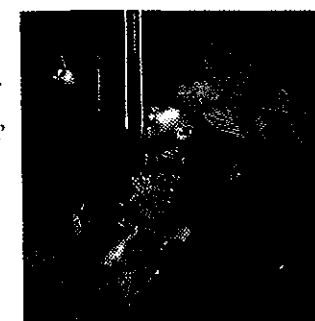
- According to the **behaviorist** perspective, parents train children in language skills through operant conditioning and imitation. Behaviorism has difficulty accounting for children's novel utterances.
- Chomsky's **nativist** theory regards children as endowed with a **language acquisition device (LAD)** containing a universal grammar common to all languages. Consistent with this perspective, a complex language system is unique to humans.
- Although language-related structures—**Broca's** and **Wernicke's areas**—exist in the left hemisphere of the cerebral cortex, their roles are more complex than previously assumed. But the broad association of left-hemispheric regions is consistent with Chomsky's notion of a brain prepared to process language. Evidence for a sensitive period for language development also supports this view.
- Difficulty specifying the universal grammar that underlies the vast diversity among languages challenges the nativist perspective. Children's gradual, piecemeal learning of many constructions is also inconsistent with Chomsky's theory.
- Recent theories suggest that language development results from **interactions** between inner capacities and environmental influences. Some interactionists apply the information-processing perspective to language development. Others emphasize the importance of children's social skills and language experiences.

##### Describe major milestones of language development in the first two years, individual differences, and ways adults can support infants' and toddlers' emerging capacities.

- Infants begin **cooing** at 2 months and **babbling** around 6 months. At 10 to 11 months, babies' skill at establishing **joint attention**

improves, and by 12 months they actively engage in turn-taking games and use preverbal gestures. Adults can encourage language progress by responding to infants' coos and babbles, playing turn-taking games, establishing joint attention and labeling what babies see, and responding verbally to their preverbal gestures.

- In the second half of the first year, infants begin to understand word meanings. Around 12 months, toddlers say their first word. Young children often make errors of **underextension** and **overextension**. Rate of word learning increases steadily, and once vocabulary reaches about 200 words, two-word utterances called **telegraphic speech** appear. At all ages, language **comprehension** develops ahead of **production**.
- Individual differences in early language development exist. Girls show faster progress than boys, and reserved, cautious toddlers may wait before trying to speak. Low-SES children, who receive less verbal stimulation than higher-SES children, usually have smaller vocabularies.
- Most toddlers use a **referential style** of language learning, in which early words consist largely of names for objects. A few use an **expressive style**, in which social formulas and pronouns are common and vocabulary grows more slowly.
- Adults in many cultures speak to young children in **child-directed speech (CDS)**, a simplified form of language that is well suited to their learning needs. Conversation between parent and toddler is one of the best predictors of early language development and academic competence during the school years.



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## Important Terms and Concepts

accommodation (p. 208)  
adaptation (p. 208)  
A-not-B search error (p. 211)  
assimilation (p. 208)  
autobiographical memory (p. 224)  
babbling (p. 240)  
Broca's area (p. 237)  
central executive (p. 221)  
child-directed speech (CDS) (p. 245)  
circular reaction (p. 209)  
comprehension (p. 243)  
cooing (p. 240)  
core knowledge perspective (p. 217)  
deferred imitation (p. 212)  
developmental quotient, or DQ (p. 231)  
developmentally appropriate practice (p. 233)

expressive style (p. 244)  
Home Observation for Measurement of the Environment (HOME) (p. 231)  
infantile amnesia (p. 224)  
intelligence quotient, or IQ (p. 230)  
intentional, or goal-directed, behavior (p. 210)  
joint attention (p. 241)  
language acquisition device (LAD) (p. 237)  
long-term memory (p. 221)  
make-believe play (p. 212)  
mental representation (p. 211)  
mental strategies (p. 220)  
normal distribution (p. 230)  
object permanence (p. 210)  
organization (p. 208)

overextension (p. 242)  
production (p. 243)  
recall (p. 223)  
recognition (p. 223)  
referential style (p. 244)  
scheme (p. 208)  
sensorimotor stage (p. 208)  
sensory register (p. 220)  
standardization (p. 230)  
telegraphic speech (p. 243)  
underextension (p. 242)  
violation-of-expectation method (p. 212)  
Wernicke's area (p. 237)  
working, or short-term, memory (p. 220)  
zone of proximal development (p. 227)

Indeed, the presence of a sibling seems to be especially conducive to acquiring the pragmatics of language. Preschoolers closely monitor conversations between their twin or older siblings and parents, and they often try to join in. When they do, these verbal exchanges last longer, with each participant taking more turns (Barton & Strosberg, 1997; Barton & Tomasello, 1991). As they listen to these conversations, young language learners pick up important skills, such as use of personal pronouns ("I" versus "you"), which are more common in the early vocabularies of later-born than of firstborn siblings (Pine, 1995). Furthermore, older siblings' remarks to a younger brother or sister often focus on regulating interaction: "Do you like Kermit?" "OK, your turn" (Oshima-Takane & Robbins, 2003). This emphasis probably contributes to younger siblings' conversational skills.

By age 4, children adjust their speech to fit the age, sex, and social status of their listeners. For example, in acting out roles with hand puppets, they use more commands when playing socially dominant and male roles (teacher, doctor, father) but speak more politely and use more indirect requests when playing less dominant and female roles (student, patient, mother) (Andersen, 2000).

Preschoolers' conversational skills occasionally do break down. **TAKE A MOMENT...** Engage a preschooler in conversation on the telephone, jotting down what you and the child say. Here is an excerpt from one 4-year-old's phone conversation with his grandfather:

*Grandfather:* "How old will you be?"

*John:* "Dis many." [*Holding up four fingers*]

*Grandfather:* "Huh?"

*John:* "Dis many." [*Again holding up four fingers*] (Warren & Tate, 1992, pp. 259–260)

Young children's conversations appear less mature in highly demanding situations in which they cannot see their listeners' reactions or rely on typical conversational aids, such as gestures and objects to talk about. But when asked to tell a listener how to solve a simple puzzle, 3- to 6-year-olds give more specific directions over the phone than in person, indicating that they realize that more verbal description is necessary on the phone (Cameron & Lee, 1997). Between ages 4 and 8, both conversing and giving directions over the phone improve greatly. Telephone talk provides yet another example of how preschoolers' competencies depend on the demands of the situation.

## Supporting Language Learning in Early Childhood

How can adults foster preschoolers' language development? As in toddlerhood, interaction with more skilled speakers remains vital in early childhood. Conversational give-and-take with adults, either at home or in preschool, is consistently related to language progress (Hart & Risley, 1995; NICHD Early Child Care Research Network, 2000b). Furthermore, recall that language learning and literacy development are closely linked. Return to Applying What We Know on page 347, and notice how each strategy for supporting emergent literacy also fosters language progress.

Sensitive, caring adults use additional techniques that promote language skills. When children use words incorrectly or communicate unclearly, such adults give helpful, explicit feedback: "I can't tell which ball you want. Do you mean a large or small one or a red or green one?" But they do not overcorrect, especially when children make grammatical mistakes. Criticism discourages children from freely using language in ways that lead to new skills.

Instead, adults often provide indirect feedback about grammar by using two strategies, often in combination: **recasts**—restructuring inaccurate speech into correct form, and **expansions**—elaborating on children's speech, increasing its complexity (Bohannon & Stanowicz, 1988; Chouinard & Clark, 2003). For example, if a child says, "I gotted new red shoes," the parent might respond, "Yes, you got a pair of new red shoes."

Adults can support children's grammatical learning through indirect feedback, including recasts (restructuring inaccurate speech into correct form) and expansions (elaborating on children's speech). However, exposure to a rich language environment may be more important than these strategies, which are not seen in all cultures.

However, some researchers question whether expansions and recasts are as important in children's mastery of grammar as mere exposure to a rich language environment. The techniques are not used in all cultures and do not consistently affect children's usage (Strapp & Federico, 2000; Valian, 1999). Rather than eliminating errors, perhaps expansions and recasts model grammatical alternatives and encourage children to experiment with them.

Do the findings just described remind you once again of Vygotsky's theory? In language, as in other aspects of intellectual growth, parents and teachers gently prompt young children to take the next developmental step forward. Children strive to master language because they want to connect with other people. Adults, in turn, respond to children's desire to become competent speakers by listening attentively, elaborating on what children say, modeling correct usage, and stimulating children to talk further. In the next chapter, we will see that this combination of warmth and encouragement of mature behavior is at the heart of early childhood emotional and social development as well.

**recasts** Adult responses that restructure children's grammatically inaccurate speech into correct form.

**expansions** Adult responses that elaborate on children's speech, increasing its complexity.

## Ask Yourself

**Review** Provide a list of recommendations for supporting language development in early childhood, noting research that supports each.

**Apply** Sammy's mother explained to him that the family would take a vacation in Miami. The next morning,

Sammy announced, "I gotted my bags packed. When are we going to Your-ami?" What explains Sammy's errors?

**Connect** Explain how children's strategies for word learning support the interactionist perspective on language development, described on pages 239–240 in Chapter 6.

# Summary

## Piaget's Theory: The Preoperational Stage

**Describe advances in mental representation, and limitations of thinking, during the preoperational stage.**

- Rapid advances in mental representation, notably language and make-believe play, mark the beginning of Piaget's **preoperational stage**. With age, make-believe becomes increasingly complex, evolving into **sociodramatic play**. Make-believe supports many aspects of cognitive and social development.
- **Dual representation** improves rapidly over the third year of life. Children realize that photographs, drawings, models, and simple maps correspond to circumstances in the real world. Adult teaching and experience with diverse symbols help preschoolers master many symbol–real world relations.
- Aside from representation, Piaget described preschoolers in terms of deficits rather than strengths. Preoperational children often fail to imagine the perspectives of others. Because this **egocentrism** prevents children from reflecting on their own thinking and

accommodating, it contributes to **animistic thinking**, **centration**, and **irreversibility**. These difficulties cause preschoolers to fail conservation and hierarchical classification tasks.

**What does follow-up research imply about the accuracy of Piaget's preoperational stage?**

- When young children are given simplified problems relevant to their everyday lives, their performance appears more mature than Piaget assumed. Preschoolers recognize differing perspectives, distinguish animate from inanimate objects, and notice and reason about transformations and cause-and-effect relations. Their language reflects accurate causal reasoning and hierarchical classification. And they show impressive skill at categorizing on the basis of non-observable characteristics and notice distinctions between appearance and reality, revealing that their thinking is not dominated by perceptual appearances.
- These findings challenge Piaget's concept of stage. Rather than being absent in the preschool years, operational thinking develops gradually.



### What educational principles can be derived from Piaget's theory?

- A Piagetian classroom promotes discovery learning, sensitivity to children's readiness to learn, and acceptance of individual differences.

### Vygotsky's Sociocultural Theory

#### Describe Vygotsky's perspective on the social origins and significance of children's private speech.

- In contrast to Piaget, Vygotsky regarded language as the foundation for all higher cognitive processes. According to Vygotsky, **private speech**, or language used for self-guidance, emerges out of social communication as adults and more skilled peers help children master challenging tasks within the zone of proximal development. Eventually, private speech is internalized as inner, verbal thought.

- **Intersubjectivity** and **scaffolding** are two features of social interaction that promote transfer of cognitive processes to children. The term **guided participation** recognizes situational and cultural variations in adult support of children's efforts.



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#### Describe applications of Vygotsky's theory to education, and evaluate his major ideas.

- A Vygotskian classroom emphasizes assisted discovery, in which both teacher guidance and peer collaboration are vitally important. Make-believe play is a unique, broadly influential zone of proximal development in early childhood.
- In granting social experience a central role in cognitive development, Vygotsky's theory helps us understand the wide cultural variation in cognitive skills. In some cultures, verbal communication is not the only means—or even the most important means—through which children learn.
- Vygotsky said little about how basic cognitive and motor capacities, which develop in infancy, contribute to socially transmitted higher cognitive processes.

### Information Processing

#### How do attention, memory, and problem solving change during early childhood?

- Sustained attention increases sharply between ages 2½ and 3, due to growth of the frontal lobes of the cerebral cortex, the capacity to generate complex play goals, and adult scaffolding. **Planning** also improves. Nevertheless, compared with older children, preschoolers spend relatively short periods involved in tasks and are less systematic in planning.
- Young children's recognition memory is remarkably accurate. But their recall of listlike information is much poorer than that of older children, largely because they use **memory strategies** less effectively.
- **Episodic memory**, or memory for everyday experiences, is well developed in early childhood. Like adults, preschoolers remember recurring events as **scripts**, which become more elaborate with age.
- As cognitive and conversational skills improve, children's autobiographical memories become better organized, detailed,

and related to the larger context of their lives, especially when adults use an elaborative style to talk about the past.

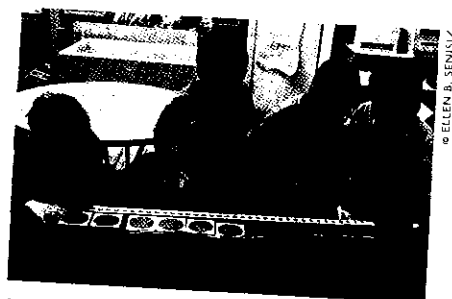
- According to **overlapping-waves theory**, children try out various strategies to solve challenging problems, gradually selecting those that result in rapid, accurate solutions. Practice with strategies, reasoning, tasks with new challenges, and adult assistance contribute to improved problem solving.

#### Describe the young child's theory of mind.

- Preschoolers begin to construct a theory of mind, indicating that they are capable of **metacognition**, or thinking about thought. From age 4 on, they realize that both beliefs and desires can influence behavior and that people can hold false beliefs.
- Factors contributing to young children's understanding of mental life include language and cognitive skills, make-believe play and reasoning about imaginary situations, and social interaction with older siblings, friends, and adults.
- Preschoolers regard the mind as a passive container of information. As a result, they have difficulty inferring what people know or are thinking about.

#### Summarize children's literacy and mathematical knowledge during early childhood.

- Young children's **emergent literacy** reveals that they understand a great deal about written language before they read and write in conventional ways. Preschoolers gradually revise incorrect ideas about the meaning of written symbols as their perceptual and cognitive capacities improve, as they encounter writing in many contexts, and as adults help them make sense of written information.
- Literacy development builds on a foundation of spoken language and knowledge about the world. **Phonological awareness** is a strong predictor of emergent literacy and of later reading and spelling achievement. Adult-child narrative conversations and informal literacy experiences, such as interactive storybook reading, also contribute greatly to literacy development.
- Mathematical reasoning also builds on informal knowledge. Toddlers' beginning grasp of **ordinality** serves as the basis for more complex understandings. As children experiment with counting, they discover additional mathematical principles, including **cardinality**. Gradually, counting becomes more flexible and efficient, and children use it to solve simple arithmetic problems. The more occasions adults provide for counting and comparing quantities, the sooner children construct basic numerical concepts.



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### Individual Differences in Mental Development

#### Describe the content of early childhood intelligence tests and the impact of home, preschool and kindergarten programs, child care, and educational media on mental development.

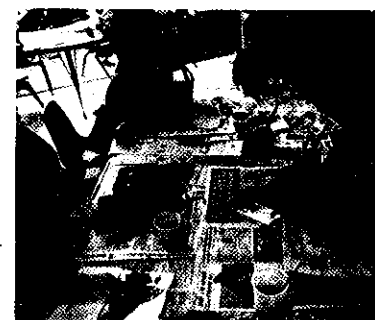
- Intelligence tests in early childhood sample a range of verbal and nonverbal skills, including vocabulary, memory, quantitative knowledge, problem solving, and spatial reasoning. By age 6 to 7, scores are good predictors of later IQ and academic achievement.

- Children growing up in warm, stimulating homes with parents who make reasonable demands for mature behavior score higher on mental tests. Home environment plays a major role in the poorer intellectual performance of low-SES children in comparison to their higher-SES peers.

- Preschool and kindergarten programs include both **child-centered programs**, in which much learning occurs through play, and **academic programs**, in which teachers train children in academic skills, often using repetition and drill. Emphasizing formal academic instruction undermines young children's motivation and negatively influences later school achievement.

- **Project Head Start** is the most extensive federally funded preschool program for low-income children in the United States. In Canada, **Aboriginal Head Start** serves First Nations, Inuit, and Métis preschoolers. High-quality preschool intervention results in immediate IQ and achievement gains and long-term improvements in school adjustment, educational attainment, and life success. The more parents are involved in Head Start, the higher their children's year-end academic, language, and social skills.

- Regardless of SES, poor-quality child care undermines preschoolers' cognitive and social skills, while good child care enhances cognitive, language, and social development, especially for low-SES children. Factors affecting quality of child care include group size, caregiver-child ratio, caregivers' educational preparation, and caregivers' personal commitment to learning about and caring for children.



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- Children pick up academic knowledge from educational television and computer software. TV shows with slow-paced action and easy-to-follow story lines help preschoolers comprehend program content. Heavy exposure to commercial entertainment TV, cartoons, and inappropriate computer games reduces time spent reading and interacting with others and is associated with poorer academic achievement after starting school.

### Language Development

#### Trace the development of vocabulary, grammar, and conversational skills in early childhood.

- Supported by **fast mapping**, preschoolers' vocabularies increase dramatically. Early in vocabulary growth, children seem to adopt a **mutual exclusivity bias** when objects differ perceptually—for example, in shape. Preschoolers also engage in **syntactic bootstrapping**, discovering a new word's meaning by observing how it is used in the structure of sentences. And they make use of adults' social cues and directly provided information. As their vocabulary and general knowledge improve, preschoolers extend language meanings through word coinages and metaphors.

- Some researchers believe that children are innately biased to induce word meanings using certain principles. Others think that children use multiple cues for word learning, which is governed by the same cognitive strategies that children apply to nonlinguistic information.

- Between ages 2 and 3, children adopt the word order of their language. As they gradually master grammatical constructions, they occasionally **overregularize**, applying the rules to words that are exceptions. By the end of the preschool years, children have acquired a wide variety of complex grammatical forms.

- Some experts believe that grammar is a product of general cognitive development. According to one view, children engage in **semantic bootstrapping**, relying on word meanings to figure out grammatical rules. Others agree with the essence of Chomsky's theory that children's brains are innately tuned for acquiring grammar.

- **Pragmatics** refers to the practical, social side of language. In face-to-face interaction with peers, young preschoolers are already skilled conversationalists. By age 4, they adapt their speech to their listeners in culturally accepted ways. Preschoolers' communicative skills appear less mature in highly demanding contexts—for example, over the telephone.

#### Cite factors that support language learning in early childhood.

- Conversational give-and-take with more skilled speakers fosters preschoolers' language skills. Adults provide both explicit feedback on the clarity of children's utterances and indirect feedback about grammar through **recasts** and **expansions**. However, some researchers believe these strategies, which are not used in all cultures, are less important than mere exposure to a rich language environment.

## Important Terms and Concepts

Aboriginal Head Start (p. 351)

academic programs (p. 350)

animistic thinking (p. 325)

cardinality (p. 348)

centration (p. 325)

child-centered programs (p. 350)

conservation (p. 325)

dual representation (p. 324)

egocentrism (p. 325)

emergent literacy (p. 346)

episodic memory (p. 340)

expansions (p. 360)

fast mapping (p. 356)

guided participation (p. 335)

hierarchical classification (p. 326)

intersubjectivity (p. 335)

irreversibility (p. 325)

memory strategies (p. 339)

metacognition (p. 342)

mutual exclusivity bias (p. 356)

ordinality (p. 348)

overlapping-waves theory (p. 341)

overregularization (p. 358)

phonological awareness (p. 346)

planning (p. 339)

pragmatics (p. 359)

preoperational stage (p. 322)

private speech (p. 334)

Project Head Start (p. 351)

recasts (p. 360)

scaffolding (p. 335)

scripts (p. 340)

semantic bootstrapping (p. 359)

sociodramatic play (p. 323)

syntactic bootstrapping (p. 357)



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Compared with their American counterparts, Japanese children have a longer school day, which permits frequent alternation of academic instruction with pleasurable activity—an approach that fosters learning. During a break from academic subjects, these Japanese students enjoy a calligraphy class.

less repetition of previously taught material. And Japanese elementary school teachers are three times as likely as U.S. teachers to work outside class with students who need extra help (Woodward & Ono, 2004).

- **More time devoted to instruction.** In Japan, Hong Kong, and Taiwan, the school year is more than 50 days longer than in the United States and about 30 days longer than in Canada (World Education Services, 2007). And on a day-to-day basis, Asian teachers devote more time to academic pursuits (Stevenson, Lee, & Mu, 2000). But Asian schools are not regimented places. An 8-hour school day allows time for extra recesses as well as field trips and extracurricular activities (Stevenson, 1994). Frequent breaks may increase Asian children's capacity to learn (see page 433 in Chapter 11).

The Asian examples underscore the need for families, schools, and the larger society to work together to upgrade education. Currently, the United States is investing more tax dollars in elementary and secondary education and strengthening teacher preparation. In addition, many schools are taking steps to increase parent involvement. Children whose parents create stimulating learning environments at home, monitor their child's academic progress, help with homework, and communicate often with teachers consistently show superior achievement (Christenson & Sheridan, 2001). The results of these efforts can be seen in recent national

assessments of educational progress (U.S. Department of Education, 2003, 2005b). After two decades of decline, American students' overall academic achievement has risen, although not enough to enhance their standing internationally.

## Ask Yourself

- **Review** List some teaching practices that foster children's academic achievement and some that undermine it. Provide a brief explanation for each practice.

- **Apply** Sandy, a parent of a third grader, wonders whether she should support her school board's decision to teach first, second, and third graders together, in mixed-age classrooms. How would you advise Sandy, and why?

- **Connect** Review research on child-rearing styles on pages 398–400 in Chapter 10. What style do gifted children who realize their potential typically experience? Explain.

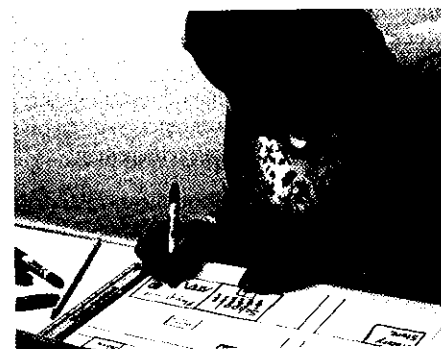
- **Reflect** What grouping practices were used in your elementary education—homogeneous, heterogeneous, or a combination? What impact do you think those practices had on your motivation and achievement?

# Summary

## Piaget's Theory: The Concrete Operational Stage

**What are the major characteristics of concrete operational thought?**

- During the **concrete operational stage**, children can reason logically about concrete, tangible information. Mastery of conservation indicates that children are capable of mental actions that obey logical rules, including **decentration** and **reversibility**. They are more aware of classification hierarchies and capable of **seriation**, including **transitive inference**, or seriating mentally.
- Spatial reasoning also improves, as revealed by school-age children's ability to give directions and their understanding of **cognitive maps**. Children's approach to map-making is influenced by cultural frameworks as well as cognitive maturity.



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**Discuss recent research on concrete operational thought.**

- Specific cultural practices, especially those associated with schooling, promote mastery of Piagetian tasks. In cultures where children seldom attend school, certain informal, nonschool experiences foster operational thought in everyday situations.
- Information-processing research helps explain the gradual mastery of logical thinking in middle childhood. Case's neo-Piagetian theory proposes that with practice, cognitive schemes demand less attention and become more automatic, freeing up space in working memory for combining old schemes and generating new ones. Eventually, children consolidate schemes into central conceptual structures, highly efficient networks of concepts and relationships that permit them to think more effectively in a wide range of situations.
- On diverse tasks, children move from a focus on only one dimension to coordinating two dimensions to integrating multiple dimensions. Because different forms of the same logical insight vary in their processing demands and children's experiences vary widely, many understandings appear in specific situations at different times rather than being mastered all at once.

## Information Processing

**Cite basic changes in information processing, and describe the development of attention and memory in middle childhood.**

- Brain development contributes to gains in information-processing speed and capacity during the school years. Gains in inhibition also occur, supporting information processing by preserving space in working memory for the task at hand.

- During middle childhood, attention becomes more selective and adaptable. Attention (and memory) strategies develop in a four-step sequence: (1) **production deficiency** (failure to use the strategy); (2) **control deficiency** (failure to execute the strategy consistently); (3) **utilization deficiency** (consistent use of the strategy, but without improvement in performance); and finally (4) **effective strategy use**.

- School-age children also become better at planning. On tasks requiring systematic visual search or the coordination of many acts, they are more likely to decide in advance how to proceed.

- Deficits in executive processing and inhibition may underlie the serious attentional and impulse-control difficulties of children with **attention-deficit hyperactivity disorder (ADHD)**. ADHD leads to serious academic and social problems.

- Memory strategies improve during the school years. **Rehearsal** appears first, followed by **organization** and then **elaboration**. With age, children use several memory strategies at once.

- Development of the long-term knowledge base facilitates strategic memory processing. Children's motivation to use what they know also contributes to memory development. Memory strategies are promoted by learning activities in school and are not used by children in non-Western cultures who have no formal schooling.

**Describe the school-age child's theory of mind and capacity to engage in self-regulation.**

- Metacognition expands over middle childhood as children better understand the process of thinking and the factors that influence it. School-age children regard the mind as an active, constructive agent. Their understanding of sources of knowledge expands. They realize that people can extend their knowledge by making mental inferences, and they grasp second-order false belief, which is helpful in understanding others' perspectives. They also appreciate the benefits of mental strategies.
- School-age children gradually improve at **cognitive self-regulation**—putting what they know about thinking into action. Giving children instructions for monitoring their cognitive activity improves self-regulatory skills and task performance.

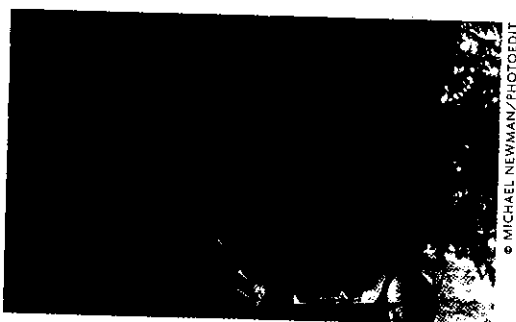
**Discuss current perspectives on teaching reading and mathematics to elementary school children.**

- Skilled reading draws on all aspects of the information-processing system. Research shows that a combination of **whole-language** and **phonics approaches** is most effective for teaching beginning reading. Whole language keeps reading meaningful, while phonics enables children to decode new words.
- As with reading, instruction that combines practice in basic skills with conceptual understanding is best in mathematics. Students acquire both math facts and complex math skills through extensive opportunities to experiment with strategies and reason about number concepts. Conceptual knowledge greatly aids complex math computation. Teaching by rote, by contrast, is associated with computational error and inability to apply procedures to new problems.

## Individual Differences in Mental Development

### Describe major approaches to defining intelligence.

- During the school years, IQ becomes more stable and correlates well with academic achievement. Most intelligence tests yield an overall score as well as scores for separate intellectual factors. The Stanford-Binet Intelligence Scales, Fifth Edition, and the Wechsler Intelligence Scale for Children-IV (WISC-IV) are widely used individually administered intelligence tests.
- To search for the precise mental processes underlying mental ability factors, researchers are combining the factor-analytic approach with the information-processing approach. Findings reveal that speed of processing is related to IQ, as are flexible attention, memory, and reasoning strategies.
- Sternberg's **triarchic theory of successful intelligence** extends these efforts. It views intelligence as a complex interaction of analytical intelligence (information-processing skills), creative intelligence (ability to solve novel problems), and practical intelligence (application of intellectual skills in everyday situations). The practical intelligence of many ethnic minority children is not tapped by mental tests.
- Gardner's **theory of multiple intelligences** identifies at least eight independent mental abilities, each with a unique biological basis and a distinct course of development. Gardner's theory has been helpful in understanding and nurturing children's talents. It has also stimulated efforts to define, measure, and foster **emotional intelligence**.



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### Describe evidence indicating that both heredity and environment contribute to intelligence.

- Heritability estimates and adoption research reveal that intelligence is a product of both heredity and environment. Studies of African-American children adopted into economically well-off white homes indicate that the black-white IQ gap is substantially determined by environment. A dramatic generational increase in IQ also supports the role of environmental factors.
- IQ scores are affected by culturally influenced communication styles, exposure to specific information that is part of majority-culture upbringing, and the sheer amount of time a child spends in school. **Stereotype threat** can trigger anxiety that impairs children's test performance.
- Because of cultural bias in intelligence testing, IQ scores can underestimate minority children's intelligence. By introducing purposeful teaching into the testing situation, **dynamic assessment** narrows the gap between a child's actual and potential performance.

## Language Development

### Describe changes in metalinguistic awareness, vocabulary, grammar, and pragmatics during middle childhood.

- Schooling, especially reading, contributes greatly to **metalinguistic awareness** and other complex language competencies. Vocabulary continues to grow rapidly, and children have a more precise and flexible understanding of word meanings. Grasp of complex grammatical constructions also improves.
- School-age children also gain in pragmatics. They adapt to listeners' needs in challenging communicative situations, better evaluate the clarity of others' messages, and refine their conversational strategies.

### What are the advantages of bilingualism in childhood?

- Children who learn two languages in early childhood separate the two language systems from the start and acquire each according to a typical timetable. When school-age children acquire a second language after mastering the first, they take 3 to 5 years to attain the competence of native-speaking age-mates. Bilingual children are advanced in cognitive development and metalinguistic awareness. They transfer their phonological awareness skills in one language to the other, which enhances reading achievement.
- In Canada, language immersion programs succeed in developing children who are proficient in both English and French. Bilingual education that combines instruction in the native language and in English supports American non-English-speaking minority children's academic learning.

## Children's Learning in School

### Describe the impact of class size and educational philosophies on children's motivation and academic achievement.

- As class size declines, academic achievement improves. Older students in **traditional classrooms** have a slight edge in academic achievement. Those in **constructivist classrooms** tend to be critical thinkers who are advanced in social and maturity and have more positive attitudes toward school.
- Vygotsky's sociocultural theory has inspired **social-constructivist classrooms**, which use the rich social context of the classroom to promote children's learning. Vygotsky-inspired teaching methods include **reciprocal teaching** and **communities of learners**. In each, learning experiences involve teacher-child and child-child collaboration, children acquire literacy skills through meaningful activities, and teaching adapts to each child's zone of proximal development.

### Discuss the role of teacher-student interaction and grouping practices in academic achievement.

- Teaching that encourages high-level thinking and that creates a warm, stimulating, demanding academic climate fosters children's interest, involvement, and academic achievement. **Educational self-fulfilling prophecies**, which are most likely to occur in classrooms that emphasize competition and public evaluation, have a greater impact on low achievers.
- Homogeneous grouping by ability is linked to poorer-quality instruction and a drop in self-esteem and achievement for children in low-ability groups. In contrast, heterogeneous grouping,

including multigrade classrooms, promotes academic achievement, self-esteem, and positive school attitudes. For collaboration between heterogeneous peers to lead to achievement gains, children need extensive training and guidance in **cooperative learning**.

### Describe educational benefits of computer use as well as concerns about computers.

- Educational software that permits children to practice basic skills and solve problems results in achievement gains. Word processing frees children to write longer, higher-quality text. Computer programming promotes a variety of complex cognitive skills. However, gender and SES differences exist in time spent with computers and confidence in using them.

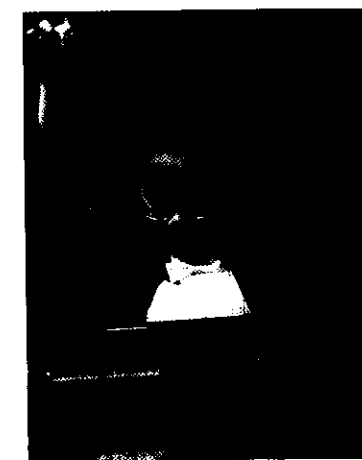
### Under what conditions is placement of mildly mentally retarded and learning disabled children in regular classrooms successful?

- U.S. and Canadian legislation has led to increasing use of **inclusive classrooms**, where students with learning difficulties (both those with mild mental retardation and a larger number who have **learning disabilities**) learn alongside typical students, often through full inclusion. The success of regular classroom placement depends on tailoring learning experiences to children's academic needs and promoting positive peer relations.

### Describe the characteristics of gifted children and current efforts to meet their educational needs.

- **Giftedness** includes high IQ, **creativity**, and **talent**. Tests of creativity that tap **divergent thinking** rather than **convergent thinking** focus on only one of the complex cognitive ingredients of creativity. People usually demonstrate expertise and creativity in only one or a few related areas.

- Highly talented children are biologically prepared to master their domain of interest and have parents and teachers who nurture their extraordinary ability. Extreme giftedness often results in social isolation. Gifted girls, especially, report more emotional and social difficulties. Gifted children are best served by educational programs that build on their special strengths.



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### How well are North American children achieving compared with children in other industrialized nations?

- In international studies, young people in Asian nations are consistently top performers. Canadian students generally score high, whereas U.S. students typically display average or below-average performance. A strong cultural commitment to learning in families and schools underlies the high academic success of Asian students.

## Important Terms and Concepts

attention-deficit hyperactivity disorder (ADHD) (p. 444)

cognitive maps (p. 438)

cognitive self-regulation (p. 448)

communities of learners (p. 469)

concrete operational stage (p. 438)

constructivist classroom (p. 467)

control deficiency (p. 443)

convergent thinking (p. 473)

cooperative learning (p. 470)

creativity (p. 473)

decentration (p. 438)

divergent thinking (p. 473)

dynamic assessment (p. 460)

educational self-fulfilling prophecies (p. 470)

effective strategy use (p. 443)

elaboration (p. 446)

emotional intelligence (p. 457)

gifted (p. 472)

inclusive classrooms (p. 472)

learning disabilities (p. 472)

metalinguistic awareness (p. 462)

organization (p. 445)

phonics approach (p. 449)

production deficiency (p. 443)

reciprocal teaching (p. 468)

rehearsal (p. 445)

reversibility (p. 438)

seriation (p. 438)

social-constructivist classroom (p. 467)

stereotype threat (p. 459)

talent (p. 473)

theory of multiple intelligences (p. 455)

traditional classroom (p. 467)

transitive inference (p. 438)

triarchic theory of successful intelligence (p. 454)

utilization deficiency (p. 443)

whole-language approach (p. 449)



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Teenagers' employment opportunities are generally limited to menial tasks that do little to extend their knowledge or skills. Students with a heavy time commitment to such jobs are less likely to participate in extracurricular activities and more likely to drop out of school.

High school students on site in a home-construction course learn energy-efficient building techniques from an expert. The success of apprenticeship programs in several European countries suggests that similar programs would improve the transition from school to work in the United States and Canada.



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hoped to work in data processing after graduation, but six months later he was still a clerk at the candy store. Although Martin had filled out many job applications, he got no interviews or offers. He soon despaired of discovering any relationship between his schooling and a career.

Martin's inability to find a job other than the one he had held as a student is typical for North American non-college-bound high school graduates. Although they are more likely to find employment than youths who drop out, they have fewer work opportunities than high school graduates of several decades ago. About 15 percent of Canadian and 20 percent of U.S. recent high school graduates who do not continue their education are unemployed (Statistics Canada, 2004c; U.S. Department of Education, 2006b). When they do find work, most are limited to temporary, low-paid, unskilled jobs. In addition, they have few alternatives for vocational counseling and job placement as they transition from school to work (Shanahan, Mortimer, & Krüger, 2002).

North American employers regard recent high school graduates as poorly prepared for skilled business and industrial occupations and manual trades. And there is some truth to this impression. In high school, nearly half of North American adolescents are employed—a greater percentage than in other developed countries (Bowlby & McMullen, 2002; Children's Defense Fund, 2006). But most are middle-SES students in pursuit of spending money rather than vocational exploration and training. Low-income teenagers who need to contribute to family income find it harder to get jobs (U.S. Department of Education, 2006b).

Furthermore, the jobs that adolescents hold are largely limited to low-level, repetitive tasks that provide little contact with adult supervisors. A heavy commitment to such jobs is harmful. The more hours students work, the poorer their school attendance, the lower their grades, the less likely they are to participate in extracurricular activities, and the more likely they are to drop out (Marsh & Kleitman, 2005). Students who spend many hours at such jobs also tend to feel more distant from their parents and report more drug and alcohol use and delinquent acts (Kouvonen & Kivivuori, 2001; Staff & Uggen, 2003).

When work experiences are specially designed to meet educational and vocational goals, outcomes are different. Participation in work-study programs or other jobs that provide academic and vocational learning opportunities is related to positive school and work attitudes, improved achievement, and reduced delinquency (Hamilton & Hamilton, 2000; Staff & Uggen, 2003). Yet high-quality vocational preparation for non-college-bound North American adolescents is scarce. Unlike some European nations, the United States and Canada have no widespread training systems to prepare youths for skilled business and industrial occupations and manual trades (Heinz, 1999a).

In Germany, adolescents who do not go to a *Gymnasium* (college-preparatory high school) have access to one of the world's most successful work-study apprenticeship systems for entering business and industry. About two-thirds of German youths participate. After completing full-time schooling at age 15 or 16, they spend the remaining two years of compulsory education in the *Berufsschule*, which offers part-time vocational courses that they combine with an apprenticeship that is jointly planned by educators and employers. Students train in work settings for more than 400 blue- and white-collar occupations. Apprentices who complete the program and pass a qualifying examination are certified as skilled workers and earn union-set wages. Businesses provide financial support because they know that the program guarantees a competent, dedicated work force (Heinz, 1999b; Kerckhoff, 2002). Many apprentices are hired into well-paid jobs by the firms that trained them.

The success of the German system—and of similar systems in Austria, Denmark, Switzerland, and several Eastern European countries—suggests that a national apprenticeship program would improve the transition from high school to work for North American

non-college-bound young people. The many benefits of bringing together the worlds of schooling and work include helping non-college-bound young people establish productive lives right after graduation, motivating at-risk youths to stay in school, and contributing to the nation's economic growth. Nevertheless, implementing an apprenticeship system poses major challenges: overcoming the reluctance of employers to assume part of the responsibility for vocational training, ensuring cooperation between schools and businesses, and preventing low-SES youths from being concentrated in the lowest-skilled apprenticeship placements, an obstacle that Germany itself has not yet fully overcome (Hamilton & Hamilton, 2000). Currently, small-scale school-to-work projects in the United States and Canada are attempting to solve these problems and build bridges between learning and working.

Although vocational development is a lifelong process, adolescence is a crucial period for defining occupational goals. Young people who are well-prepared for an economically and personally satisfying work life are much more likely to become productive citizens, devoted family members, and contented adults. The support of families, schools, businesses, communities, and society as a whole can contribute greatly to a positive outcome.

## Ask Yourself

**Review** What can your school take to help ensure that adolescents of all backgrounds match their interests with their abilities and abilities with the world of work?

**Apply** Imagine a high school senior who knows that he wants to work with people, but doesn't yet have a specific career goal. How might a high school teacher or counselor help him? What steps can he take to explore his interests and abilities in the world of work and help him reach an occupational goal?

**Connect** What have you learned in previous chapters about development of gender identity? How might this explain why women prosper in nursing and teaching and men prosper in professions that demand physical strength? (Hint: see Chapter 12, pages 503–504.)

**Reflect** Describe your progress in choosing a career. What personal and environmental factors have been influential?

# Summary

## Piaget's Theory: The Formal Operational Stage

What are the major characteristics of formal operational thought?

- During Piaget's **formal operational stage**, adolescents become capable of **hypothetico-deductive reasoning**: When faced with a problem, they start with a hypothesis about variables that might affect an outcome, deduce logical, testable inferences, and systematically isolate and combine variables to see which inferences are confirmed.
- **Propositional thought** also develops. Young people can evaluate the logic of verbal statements without referring to real-world circumstances.

Discuss recent research on formal operational thought and its implications for the accuracy of Piaget's formal operational stage.

- School-age children display the beginnings of hypothetico-deductive reasoning but are less cognitively competent than adolescents. They cannot sort out evidence that bears on three or more variables at once, and they do not grasp the **logical necessity** of propositional reasoning. Also, adolescents are better than school-age children at representing major premises precisely and at thinking of examples that contradict wrong conclusions.
- Adolescents and adults are most likely to think abstractly and systematically in situations in which they have had extensive guidance and practice in using such reasoning. In tribal and village societies, formal operational tasks usually are not mastered at all.



These findings indicate that Piaget's highest stage is affected by specific learning opportunities typically encountered in school.

## An Information-Processing View of Adolescent Cognitive Development

**How do information-processing researchers account for the development of abstract thought?**

- Information-processing researchers believe that a variety of specific mechanisms, supported by both brain development and experience, underlie adolescent cognitive change. These include gains in attention, inhibition, and knowledge; more effective strategies; expansion of metacognition; and increases in cognitive self-regulation, speed of thinking, and processing capacity.

- Research on scientific reasoning reveals that the ability to coordinate theory with evidence improves from childhood to adolescence, as young people solve increasingly complex problems and reflect on their thinking, acquiring more sophisticated metacognitive understanding. Nevertheless, adolescents and adults continue to show a self-serving bias, applying logic more effectively to ideas they doubt than to ideas they favor.



- Adolescents develop scientific reasoning skills in a similar, step-by-step fashion on different types of tasks, constructing general models they can apply to many instances of a given type of problem. Formal operational thought develops gradually, not as the result of an abrupt, stagewise change.

## Consequences of Adolescent Cognitive Changes

**Describe typical reactions of adolescents that result from their advancing cognition.**

- As adolescents reflect on their own thoughts, two distorted images of the relationship between self and other appear: the **imaginary audience** and the **personal fable**. Both are an outgrowth of gains in perspective taking and teenagers' recognition that others' opinions of them have important, real consequences.
- Teenagers' capacity to think about possibilities prompts idealistic visions at odds with everyday reality. Consequently, they often become fault-finding critics.
- Adolescents show gains in cognitive self-regulation and comprehension monitoring on academic tasks. But they are less competent than adults at planning and decision making in everyday life, where they tend to fall back on intuitive judgments and emphasize short-term over long-term goals.

## Sex Differences in Mental Abilities

**Describe sex differences in mental abilities at adolescence, along with factors that influence them.**

- During adolescence, girls score slightly better than boys on tests of verbal ability, and their advantage in reading and writing

achievement increases. Earlier development of the left hemisphere of the cerebral cortex and greater maternal verbal stimulation probably contribute to girls' better verbal performance. And gender stereotyping of language arts as "feminine" and regimented teaching may weaken boys' literacy skills.

- Boys exceed girls in complex mathematical reasoning. Overall, the gender difference is small, but among the most capable students, it is greater. Boys' biologically based superior spatial skills enhance their mathematical problem solving. At the same time, childhood manipulative play activities, gender stereotyping of math as "masculine," self-confidence and interest in doing math, and specialized computer knowledge contribute to boys' spatial and math advantages.

## Language Development

**Describe changes in vocabulary, grammar, and pragmatics during adolescence.**

- Adolescents add many abstract words to their vocabulary and define these words with greater clarity and accuracy. The capacity to think flexibly about word meanings permits adolescents to better understand irony, sarcasm, and figurative language.
- Adolescents use more elaborate grammatical constructions and more effectively analyze and correct their grammar. They also show an improved capacity to vary their language style to fit the situation—a change supported by opportunities to enter more situations, the ability to reflect on the features of language, and gains in cognitive self-regulation.



## Learning in School

**Discuss the impact of school transitions on adolescent adjustment.**

- School transitions can be stressful. As school environments become larger and more impersonal, grades and feelings of competence decline. Girls experience more adjustment difficulties after the transition from elementary to middle or junior high school, a time when other life changes (puberty and the beginning of dating) are also occurring. Teenagers coping with added stresses, especially those with both academic and emotional difficulties, are at greatest risk for reduced self-esteem, achievement declines, and problem behaviors following school transition.

**Discuss family, peer, and school influences on academic achievement during adolescence.**

- Authoritative parenting and parents' school involvement promote high achievement. Teenagers whose parents value achievement are likely to choose friends from similar families. The surrounding social order affects peer cultures of minority youths, who may react against working hard in school because they see little future payoff.
- Warm, supportive classroom environments that encourage student interaction about academic work, mutual respect among classmates, and high-level thinking enable adolescents to reach

their cognitive potential. But many secondary school classrooms do not consistently provide interesting, challenging teaching.

- By high school, separate educational tracks that dovetail with adolescents' future plans are necessary. Unfortunately, high school tracking in the United States and Canada usually extends the educational inequalities of earlier years. Low-SES students are at risk for unfair placement in noncollege tracks, reduced parental involvement in their education, less stimulating teaching, and resulting declines in school performance.

**What factors are related to dropping out of school?**

- About 10 percent of American and Canadian young people, many of them low-SES minority youths, leave high school without a diploma. Dropping out is the result of a long, gradual process of disengagement from school that is influenced by both family and school factors, including poor grades, dislike of school, antisocial behavior, lack of parental support for achievement, unstimulating teaching, and experiences with discrimination.

## Vocational Development

**Trace the development of vocational choice, and describe the factors that influence adolescents' vocational decisions.**

- Vocational development typically moves through a **fantasy period**, in which children explore career options through play; a **tentative period**, in which teenagers weigh careers against their interests, abilities, and values; and a **realistic period**, in which older adolescents and emerging adults settle on a vocational category and, finally, a specific career.
- People are attracted to occupations that complement their personalities. However, personality is only moderately related to vocational choice, since individual and contextual factors combine to influence adolescents' decisions.
- Adolescents' vocational aspirations correlate strongly with the jobs of their parents. The resemblance is partly due to resemblance in personality, intellectual abilities, and—especially—educational

attainment, a powerful predictor of occupational status. In addition, higher-SES parents are more likely to give their children information about the world of work and to identify knowledgeable people who can assist them. Close

relationships with teachers, which are more available to college-bound adolescents than to others, are linked to higher career aspirations.

- Today, although more girls express interest in male-dominated occupations, gender-stereotyped messages prevent many of them from reaching their career potential. Girls' career aspirations rise in response to confidence-building messages from parents, teachers, and school counselors.

**What problems do non-college-bound North American youths face in making the transition from school to work?**

- Unlike some European nations, the United States and Canada have no widespread vocational training systems to help non-college-bound adolescents prepare for challenging, well-paid careers in business, industry, and manual trades. The jobs available to teenagers are largely limited to low-level, repetitive tasks that provide little contact with adult supervisors. Spending too many hours in these work settings undermines school performance and work-related attitudes.
- In contrast, work-study programs designed to meet both educational and vocational goals foster a positive orientation toward academic achievement and work. Youth apprenticeships that coordinate on-the-job training with classroom instruction would improve the transition from school to work for North American non-college-bound young people.



## Important Terms and Concepts

fantasy period (p. 589)  
formal operational stage (p. 566)  
hypothetico-deductive reasoning (p. 566)

imaginary audience (p. 572)  
logical necessity (p. 568)  
personal fable (p. 572)

propositional thought (p. 567)  
realistic period (p. 589)  
tentative period (p. 589)